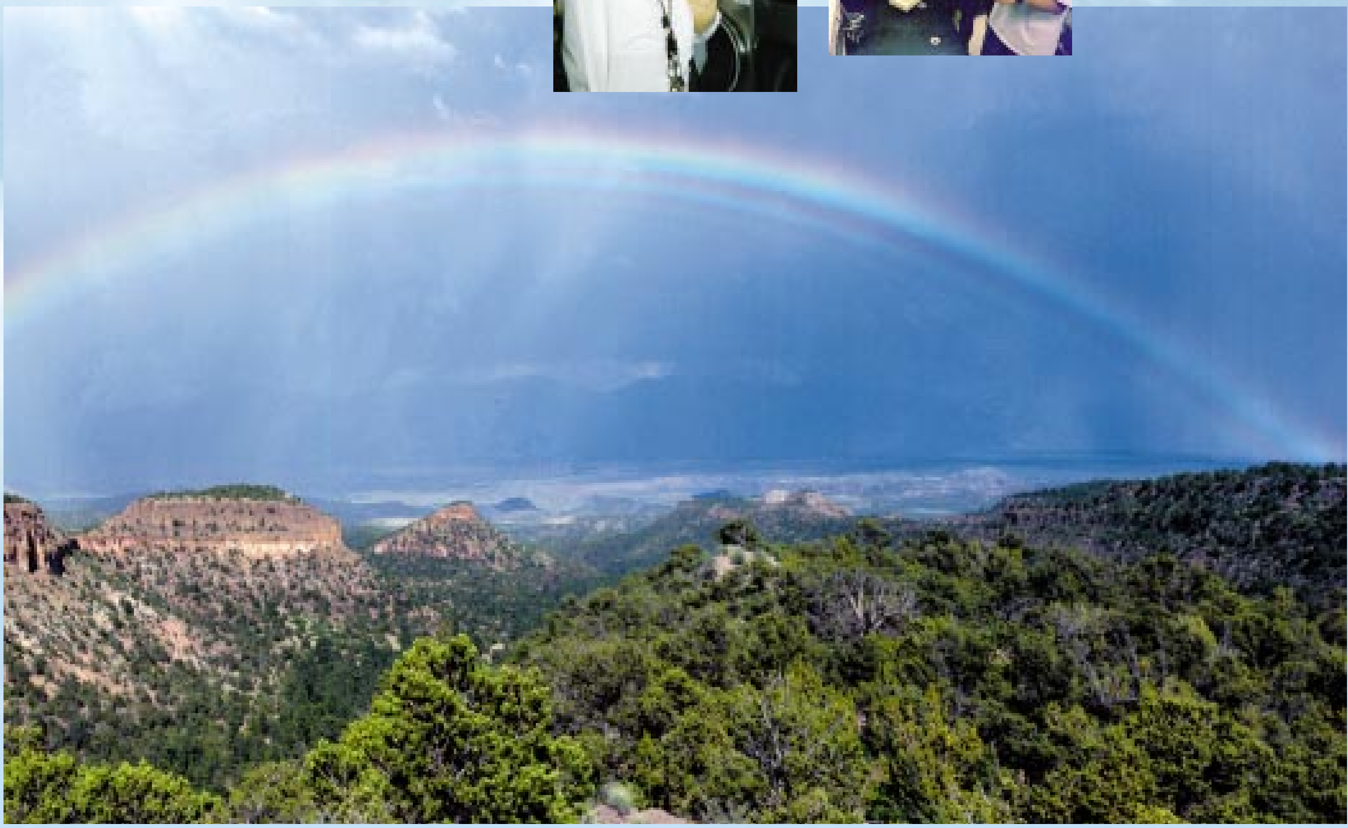
For the Seventh Generation

Environment, Safety, and Health at Los Alamos National Laboratory: A Report to Our Communities



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Los Alamos National Laboratory was established in 1943 as Project Y of the Manhattan Engineer District. Under the leadership of J. Robert Oppenheimer, the Laboratory developed the world's first atomic bomb. Today, Los Alamos is a multidisciplinary, multiprogram laboratory whose central mission still revolves around national security.

Managed by the University of California, Los Alamos maintains a commitment to its tradition of free inquiry and debate, which is essential to any scientific undertaking. Located on the Pajarito Plateau about 35 miles northwest of Santa Fe, the capital of New Mexico, Los Alamos is one of 28 Department of Energy laboratories across the country.

The Laboratory covers more than 43 square miles of mesas and canyons in northern New Mexico. As the largest institution and the largest employer in the area, the Laboratory has approximately 6 800 University of California employees plus approximately 2800 contractor personnel. Our annual budget is approximately $1.2 billion.

For the Seventh Generation

And each generation was to raise its chiefs and to look out for the welfare of the seventh generation to come.

We were to understand the principles of living together.

We were to protect the life that surrounds us.

We were to give what we had to the elders and to the children.

What of the rights of the natural world?

Who is speaking for the waters of the earth?

Who is speaking for the trees and the forests?

Who is speaking for our children?

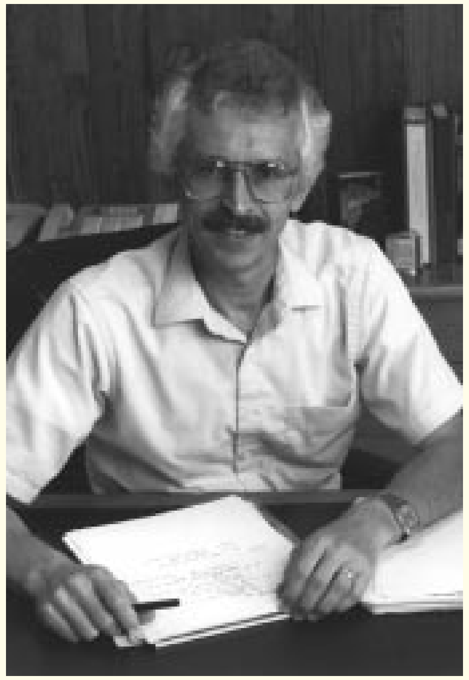
We must stand for these people, and the natural world and its rights; and also for the generations to come.

Based on a statement by Oren Lyons, Iroquois, which appears in *Look to the Mountain—An Ecology of Indigenous Education* by Gregory Cajete, Ph.D., Santa Clara Pueblo

The indigenous people of North America lived in harmony with the natural environment, protecting and conserving it so their way of life would be indefinitely sustainable. Every decision was examined for its long-term implications, not just for the tribe's children and grandchildren, but for the seventh generation to come. This philosophy is common amongst the Pueblo Nations of our region and is also to be found in the Great Law of the Iroquois Confederacy.

Letter from the Director

Siegfried S. Hecker
Director



This report is the outcome of our desire to make information about Los Alamos National Laboratory's environment, safety, and health record more accessible to the public and our employees.

Following the lead of such companies as General Motors, International Paper, and Intel, we have compiled a progress report that highlights the Lab's environmental and safety record for the year and presents it in a reader-friendly format.

This first issue of our report to our communities deals with topics ranging from the accidents we had during 1996 to how the Lab uses bees for some of its environmental sampling. We hope you'll come away with a better idea of how the Lab functions and the measures we take to protect our workers, the public, and the environment. It is also our intention to not just talk about the strides we've made in being better environmental stewards, but to let you know where we see areas for improvement and what we plan to do about them.

Because of the problems we experienced last year, we as a Laboratory have increased our dedication toward doing our work safely. We have taken steps that include the implementation of a five-step safety program to assess potential hazards before work is begun, the development of an integrated safety management program that encompasses numerous aspects of our daily operations, and the implementation of a disciplinary action plan for environment, safety, and health violations. We will not pursue any work unless it can be done safely.

On a positive note, we have implemented formal, cooperative agreements with the pueblos of Cochiti, Jemez, Santa Clara, and San Ildefonso to collaborate on environmental projects and to exchange environmental information on a regular basis. These interactions have facilitated improved relations with the tribes, and we continue to learn from them.

Let me ask that as you review this publication you please consider how we can improve future issues of our report to our communities. We welcome your suggestions and comments on how to make it as useful as possible.

Contents

Safety First!
Achieving our Laboratory's number one goal

The Laboratory will perform all work safely and will strive to eliminate injuries and to reduce adverse environmental and health impacts. All Laboratory operations will meet applicable regulations, conserve natural resources, and respond to the public's expectations for safety and for protection of the environment.

1996 Safety First Tactical Goal, Los Alamos National Laboratory

Dennis J. Erickson, Director, Environment, Safety, and Health Division, leads the division in providing technical and administrative support to the Laboratory. He helps ensure the Laboratory's operational safety and compliance with federal and state statutes and with Department of Energy regulations. Key goals for the division include developing a systematic Laboratory plan for enhancing operational effectiveness, expanding community outreach, partnering with the Department of Energy on common agendas, and teaming with other Laboratory divisions and programs to fulfill these goals.

Safety First! It's hardly a new idea. In our daily lives as family members and citizens, we follow common sense safety rules.

Safety—the inherent safety of technical systems, the quality of prescribed operating procedures, the way we do our jobs, and protection of the environment and the public—makes sense at our Laboratory. When several major accidents stunned our Laboratory and surrounding communities, we recognized a need to take a hard look at how safety fits into our work lives and to renew our safety consciousness. In 1996, our Laboratory took a significant step when it made Safety First our primary tactical goal.

In an emotional appeal to the work force, Director Hecker reinforced an institutional commitment to Safety First: "I don't care about time pressures. I don't care what other excuses we may have. We must do operations safely—that must come first. What's at stake is our lives."

The heightened safety awareness being experienced at our Laboratory is based on our commitment to improve a safety record that is unacceptable to us. We faced some hard realities in 1996—

Major Accidents

December 1994—During a training exercise, a security officer for Protection Technology Los Alamos (PTLA) is accidentally shot and killed.

November 1995—A forklift accident results in serious injury; injured worker recovers.

January 1996—An electrical accident results in near death; injured worker remains in a coma.

July 1996—An electrical accident causes serious injury; injured worker recovers.

November 1996—An explosion and fire in the Chemistry and Metallurgy Research building causes damage to property, but no injuries; accident is considered a near miss in terms of serious injuries and fatalities.

serious accidents that set the stage for a change in our work practices that will help improve worker safety. Leading the way to change is our commitment to follow not only the letter, but the spirit of Integrated Safety Management. With Safety First as a tactical goal and Integrated Safety Management as a tool

"To do great science, to accomplish our mission, we must work safely." —Director Sig Hecker

to help workers achieve that goal, our Laboratory expects to improve its environment, safety, and health record.

Integrated Safety Management

To help meet the Safety First tactical goal set by the Laboratory's Leadership Council in 1996, our Laboratory instituted Integrated Safety Management, which provides a way of doing our work while achieving the following basic safety goals:

- Keep workers injury free
- Prevent work-related illnesses
- Reduce risks
- Analyze hazards
- Protect the public
- Respect the environment
- Conserve resources

Fundamental to the system is the five-step process, shown above in the Safety First logo , that supports safe work practices.

By integrating safety into every work activity, into the hands of every worker, and into the design and function of all our facilities, we are ensuring the safest operations possible.

"Work smart" standards are helping us set up a framework for our safety system. We identify our work standards by using all the information we can gather: federal, state, and local laws and regulations; industry and consensus standards; and technical directives from the Department of Energy. As we apply these standards, our work force will continue to develop safety norms that will help ensure their safety, the safety of the public, and the protection of the environment.

Stand-Down for Safety

After a July 1996 electrical accident and for the first time in our 51-year history, we stopped all Laboratory work. The reason for this "stand-down" was to emphasize safety. Standing down reinforced the determined nature of our commitment to succeed in attaining our Safety First goal.

During the stand-down, no workers returned to their jobs until they understood and acknowledged all of their work hazards and reviewed job-related safe work practices. By the end of the stand-down and before returning to work, each worker had signed a safety commitment in which he or she pledged to maintain a heightened awareness of safety and to perform all work safely.

The right to stop work is a powerful tool for the worker as well as for Laboratory management. Every worker is obligated to call a stop to work if it's believed that work may be unsafe. Our Laboratory guarantees this right by promising the worker there will be no reprisal from management. Director Hecker gave his personal stamp of approval to the Laboratory's stop work policy as one means of reaching our Safety First goal when he said to all employees, "I am asking you to

The five steps to Safety First are illustrated in this logo, which serves to remind the workforce of its safety responsibilities.

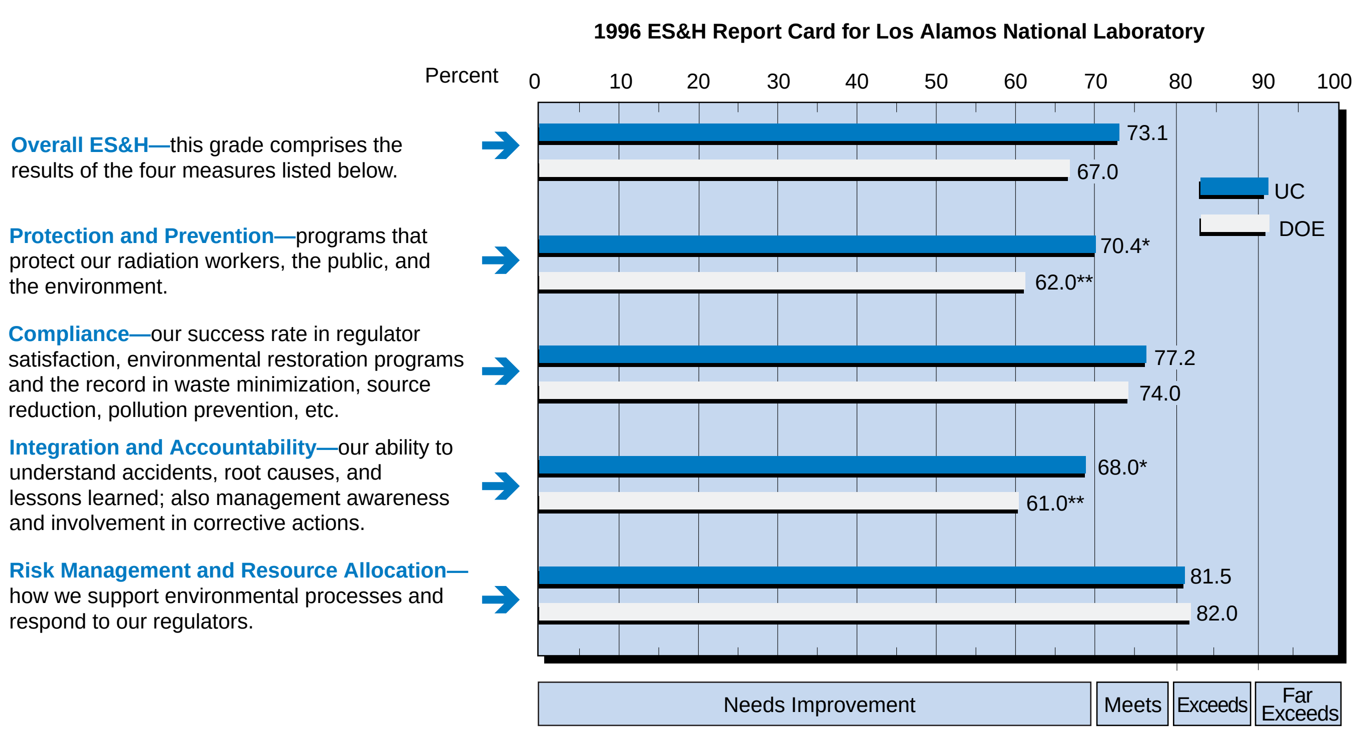
approach everything you do with safety first in your mind. It is our responsibility to take action to stop any questionable operation. Our health, plus the health of our colleagues and the public, is at stake."

Our ES&H Performance Report Card

The Laboratory reports its overall ES&H performance to the University of California and the US Department of Energy. Their response to our self-assessment tells us how we've met mutually agreed upon performance measures and provides feedback so that we can improve our operations.

Our 1996 report card, as shown below, contains a range of grades. Some of these grades indicate we need improvement. The Department and University take very seriously our recent accident history—a record also unacceptable to us. Because of these accidents, our potential grades for the year were lowered in Protection and Prevention and Integration and Accountability, 10 points by the University California and 15 points by the Department; Compliance received mixed grades. Our performance in Risk Management and Resource Allocation exceeded expectations.

Our Laboratory faces significant challenges, and we are committed to improving our safety practices as indicated by our performance measure grades. We must further endeavor to meet or exceed expectations by having our work force respond effectively to the rigorous environment, safety, and health demands in our performance measures. Meeting these challenges continues to be a top priority for the future!



* Grade reduced by 10 points because of recent serious accidents.
** Grade reduced by 15 points because of recent serious accidents.

SUCCESS STORY

Vision: Be the best security team in the Department of Energy

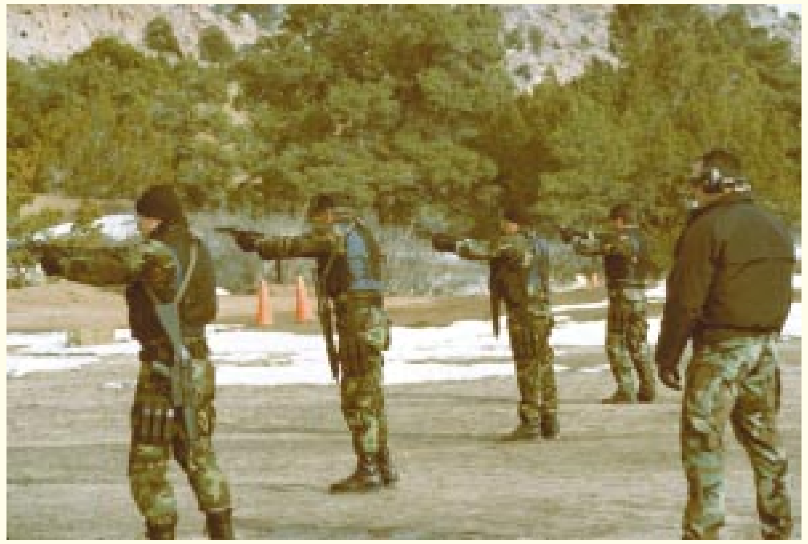
—Protection Technology Los Alamos (PTLA)

PTLA suffered a tragic accident in December 1994, when during training, a security officer was accidentally shot and killed. Since this tragedy, the organization has moved on to implement strong safeguards to prevent such future accidents. Today, PTLA is a success story about improved safety awareness in all phases of its operations.

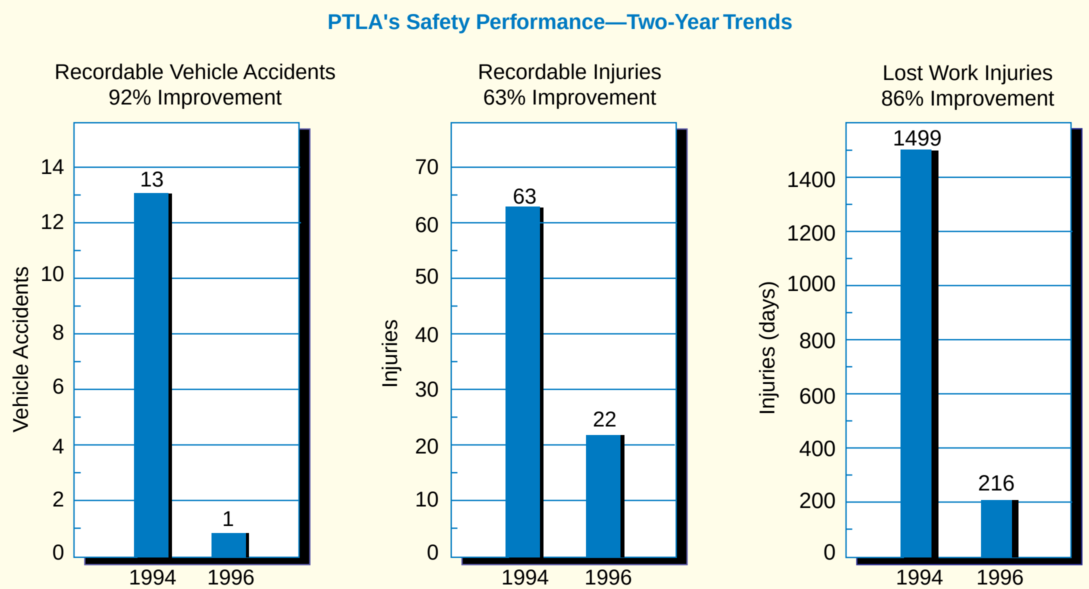
During the past year, PTLA, a contractor that provides security services to our Laboratory, used the principles of Safety First to make great progress toward its goal of being the best security team in the Department of Energy complex.

Using a new approach that emphasizes the inherent dignity and responsibility of every team member, PTLA credits its success to the belief that the person actually doing a job knows best how to improve that job.

By accomplishing their goal, PTLA team members not only make themselves safer, they also make the Laboratory more secure.



PTLA security guards practice with their firearms at the shooting range. Firearms safety and a rigorous process for conducting training exercises are important parts of PTLA's safety awareness.



Over a two-year period, PTLA made great improvements by reducing recordable accidents and injuries. Injuries recorded in compliance with Occupational Safety and Health Act standards were reduced not only in numbers but even more dramatically in days lost on the job. Worker safety awareness also accounted for a reduction in vehicular accidents; only one accident was recordable in 1996.

Satisfying Our Regulators

On the road to success

Our Laboratory must comply with federal and state laws and regulations that cover radiation protection, health and safety, transportation, and the environment. At the federal level, the Departments of Energy, Labor, and Transportation and the Environmental Protection Agency oversee the protection of workers, the public, and the environment. In New Mexico, the state Environment Department has jurisdiction over protection of the public and the environment. This story tells how one Laboratory interaction with a regulator worked during 1996.

Members of the Laboratory's Hazardous and Solid Waste Group conduct numerous analyses of waste stored at the Laboratory. (Top) Dustie Stephens and Billy Terrazas take samples of waste to be analyzed for hazardous chemicals; (Bottom) Geri Rodriquez and Michelle Cash conduct an assessment of hazardous waste at a Laboratory storage area.

During 1996, our Laboratory set a goal of 100 percent compliance with the Resource Conservation and Recovery Act, in response to 1992–1995 New Mexico Environment Department inspections. Those inspections had resulted in formal compliance orders and fines or penalties for numerous recurring violations typically classified as housekeeping or administrative—*not* violations classified as potentially dangerous to human health or the environment.

The Resource Conservation and Recovery Act regulates hazardous waste—waste that is ignitable, corrosive, reactive, toxic, and/or generated by industrial or chemical processes—from its generation to its disposal. The Act specifies extensive and detailed requirements for the storage and handling of hazardous waste, including that it be characterized by the generator, labeled and dated, segregated from incompatible wastes, inspected regularly, and stored in limited quantity and for a limited time until it is treated or disposed of.

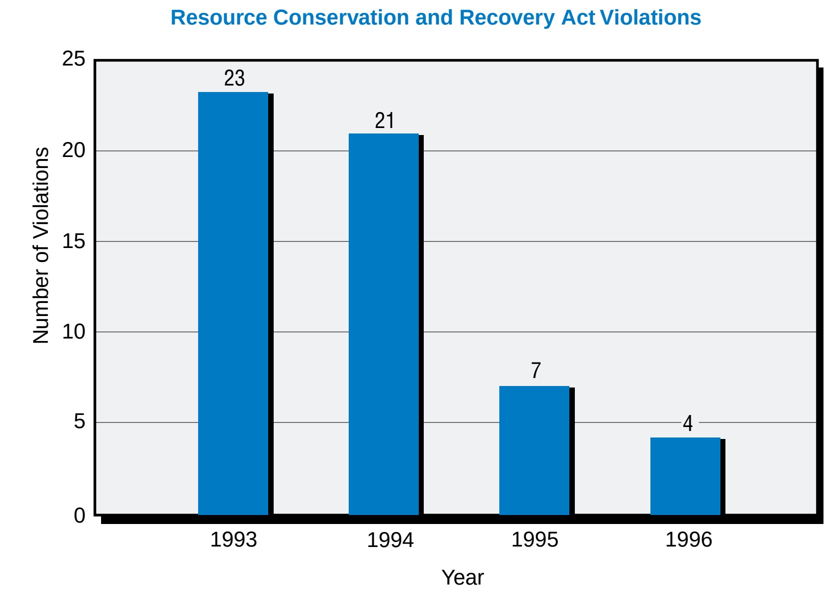
To improve our hazardous waste management efforts, we focused on three initiatives in 1996—waste management coordination, self-assessment, and charge-back of penalties and fines to any part of our Laboratory found to be out of compliance.

Through our waste management program, we trained 61 individuals across our Laboratory to coordinate waste-related activities, manage and inspect waste storage areas, and help waste generators comply with requirements. In cooperation with the waste management coordinators, personnel from our waste management organization initiated self-assessments of our storage and handling of hazardous waste. We communicated the findings to waste generators and managers across our Laboratory so they could lead the way to improvements in compliance with labeling, segregation, and storage-limit requirements. By charging individual organizations for any fines assessed for violations identified by state inspectors, we further emphasized our commitment to 100 percent compliance.

Although we have not yet achieved our goal, our record is improving. Following the July 1996 inspection, Ed Kelley, Director of the Water and Waste Management Division of the New Mexico Environment Department commended, "improvements made in LANL's efforts to comply with the New Mexico hazardous waste management regulations."

"LANL has improved its hazardous waste regulatory compliance status," Kelley noted. "There is, of course, still room for improvement, and NMED expects that LANL will continue to work toward full compliance with hazardous waste regulations as well as all other applicable environmental regulations."

We will continue our efforts to achieve our goal of 100 percent compliance.



Summary of Federal Environmental Acts Governing the Laboratory	
Federal Act	**What It Does**
Resource Conservation and Recovery Act and its Hazardous and Solid Waste Amendments	Regulates hazardous waste from generation to disposal and mandates reduction in the amount of hazardous waste produced.
Comprehensive Environmental Response, Compensation, and Liability Act	Establishes requirements for environmental restoration and outlines appropriate responses to hazardous substance releases to the environment.
Emergency Planning and Community Right-to-Know Act	Requires reporting of emissions to the environment from industrial production facilities, such as our power plant or sewage treatment plant.
Toxic Substances Control Act	Regulates the use, storage, handling, and disposal of polychlorinated biphenyls (PCBs).
Federal Insecticide, Fungicide, and Rodenticide Act	Regulates the manufacture and application of pesticides.
Clean Air Act	Regulates both radioactive and nonradioactive air emissions.
Clean Water Act	Protects the chemical, physical, and biological integrity of the nation's waters and requires permits that establish specific criteria for effluent discharges.
Safe Drinking Water Act	Requires routine water sample monitoring to determine the levels of microbiological organisms, organic and inorganic chemicals, and radioactivity in drinking water.
National Environmental Policy Act	Requires federal agencies to consider the environmental impact of their activities—including the impact on cultural resources; endangered, threatened, or sensitive species; and floodplains or wetlands—before deciding to proceed with those activities.

Worker Safety at the Laboratory

Darlene Valdez, like many parents, juggles a career with family responsibilities. At home, she can be found trying to catch up with her three-year-old son Joshua as he learns to ride his bicycle. At work, she helps radiation workers meet safety standards and helps ensure the safest possible working conditions.

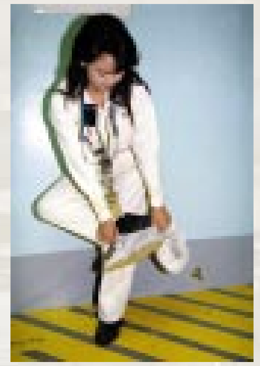
Darlene grew up and graduated from high school in the town of Peñasco. She then earned an associate's degree at Northern New Mexico Community College, where she majored in radiation protection. Her desire to do productive, hands-on work made her choice to be a radiation control technician at the Laboratory a natural one.

What does the Laboratory do to protect employees who work with radiation and radiation-emitting materials?

Every working day of her life, Darlene Valdez, a radiation control technician at the Laboratory's plutonium processing facility, lives the answer to that question. At each moment during her work day, she applies some aspect of the training she received when she started her job. And just as frequently, she uses Laboratory equipment and procedures to protect herself and the environment against any negative effects of the radiation-emitting material that she encounters on her job.

All new Laboratory employees receive general radiological training, but radiation control technicians receive more intensive instruction in working around radiation. Darlene's specialized training on the job at the plutonium facility covered maximizing her distance from the sources of radiation, minimizing the time she spends near these sources, dressing in special anticontamination clothing, monitoring her body and clothing for radioactive contamination, and using a respirator when appropriate.

"At first I was nervous about working with plutonium. But I learned that plutonium is something you have to respect, not fear. There are many good uses for plutonium, but you can never take it for granted."



Darlene is trained to put on anti-contamination clothing that will protect her: booties to keep contamination from her shoes, gloves to protect her skin, and a respirator to prevent her from inhaling contaminants.

When she leaves her work area, Darlene monitors herself, using machines near the changing area. One machine checks the palms and the backs of Darlene's hands and her feet. If a machine identifies that she's contaminated, an alarm goes off, and she gets help from another technician and her supervisor in removing the contaminated material.

A glove box allows the radiation worker to manipulate radioactive material without coming into contact with it. Darlene supports the radiation worker by providing a second pair of eyes, specially trained to spot hazards. She also checks clothing with a special piece of equipment, the Ludlum-139, which detects alpha contamination. Her job is critical to the safety of the radiation workers, who depend on her to help them avoid mishaps.

When Darlene assists a radiation worker in changing the glove-box gloves or disposing of used gloves, she wears a respirator to keep from inhaling radioactive material. She also takes smears of the plastic bags used to dispose of the gloves to make sure there is no contamination.

As Low as Reasonably Achievable—ALARA

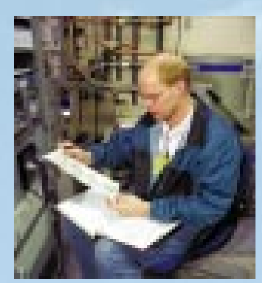
One of the ways radiation workers are protected at the Laboratory is through the ALARA philosophy, or keeping doses "as low as reasonably achievable." ALARA incorporates three important parts: maximize your distance from the source of the radiation; minimize the time you spend near the source; and shield yourself from the source.

Recently, the Laboratory ALARA Steering Committee gave awards to two employees for their achievements in keeping doses ALARA. The Los Alamos Awards Program commended Richard D. Werbeck of the Accelerator Operations and Technology Division and Dennis Brandt of the Nuclear Materials Technology Division for their initiative in maintaining a safe working environment and for taking full responsibility for their own safety and the safety of their employees.

Richard instituted changes in shielding used at experimental facilities, acquired innovative tools for the remote handling of highly radioactive material, and engineered dose reduction techniques. He also served as his group's ALARA focal point, committing himself and his group to the ALARA concept in numerous other ways that resulted in greatly reduced occupational radiation exposures to personnel working at the Los Alamos Neutron Science Center.

Dennis led the effort to establish radiation protection goals and performance measures for the Laboratory's plutonium processing facility and helped design special radiation shields, containers, and radiation detectors. He also helped the plutonium facility institute a process for establishing radiation dose limits well below the legal limits and ensuring that the exposure of individual workers is kept below those limits by regularly notifying managers of each worker's accumulated exposure.

Monitoring for Clean Air



Photographs, top to bottom: Debra Archuleta collects a glass-fiber filter from a particulate matter sampler; Debra and Kathy Garduño-Paul collect vials from a tritium sampler; Dave Fuehne reviews data from the real-time monitoring system at the Los Alamos Neutron Science Center.

One of the most striking features of northern New Mexico, our immense blue sky, is a sign to us that we breathe clean, fresh air. As part of the northern New Mexico community, our Laboratory wants to ensure that the quality of the air we breathe is not affected by Laboratory operations—especially those that include the handling of radioactive materials.

One important way we ensure that our activities do not adversely impact the environment is through our air monitoring program. To monitor the air, our Air Quality Group operates a network of 53 ambient air monitoring stations located on and near Laboratory property and in communities surrounding the Laboratory, including Santa Fe, Española, and the pueblos of Jemez, Pojoaque, San Ildefonso, and Taos.

In addition to their work with the ambient air monitoring stations, group members evaluate all Laboratory facility stacks for their potential to release radioactive materials. If an evaluation shows that emissions from a stack may potentially result in a member of the public's receiving 0.1 millirem of radiation in a year (0.1 millirem is 1/100th of the Environmental Protection Act limit of 10 millirems per year), the stack must be sampled. At the end of 1996, 31 stacks were being regularly sampled.

Debra Archuleta and Kathy Garduño-Paul are the two Air Quality Group members responsible for collecting samples from stack air samplers; in fact, the group hired and trained them in 1995 specifically to become custodians of stack air samples. "Before we joined the Air Quality Group, people at the different facilities collected their own samples. Now most of the samples are collected by Kathy or me, and we are responsible for them from sampling through analysis," explains Debra.

Debra and Kathy collect samples weekly from particulate matter and tritium samplers. Particulate matter is sampled by pulling stack air through a filter. Small particles, including those that might be radioactive, are collected by this filter. Debra or Kathy changes the filters in the samplers. Samples are then analyzed to determine the amount of radioactivity, if any, that has been released through each sampled stack.

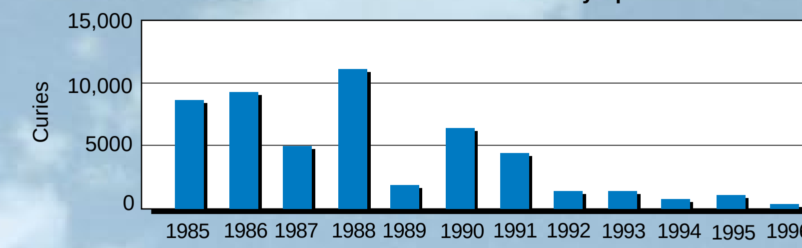
Tritium samplers—"bubblers"—work a little differently. Bubblers are used to measure tritium, which is a radioactive form of hydrogen released from some Laboratory facilities. The bubbler operates by pulling a continuous sample of air from the stack. The air is then "bubbled" through a set of sample bottles containing glycol. The first set of three vials is used to collect any water vapor from the sample (including tritiated water vapor, or tritium oxide). Then, the gaseous—or elemental—tritium is converted to tritium oxide and is collected in a second set of three vials. Debra and Kathy collect these sample bottles on a weekly basis. Samples are analyzed to determine the amount of tritium released through the stack. Preliminary screening results for both the particulate matter and tritium samplers are known within days and final results within one week of sampling. If any of the results are high, the facility will be notified, and that facility will work with the Air Quality Group on a plan to ensure that the Laboratory does not exceed standards set by the Environmental Protection Agency.

In the unique case of the Los Alamos Neutron Science Center—the largest contributor of the Laboratory's air emissions—a real-time monitoring system continuously measures the amount of radioactivity released through the Center's stacks. In the real-time process, the samples of stack air pulled through a chamber are constantly measured for the total amount of radioactivity.

Stack monitoring is just one part of the Laboratory's extensive environmental monitoring programs. We also have programs that check the air, water, sediments, soils, and foodstuffs for radiological and nonradiological contaminants that may have been released by our operations. For example, the Water Quality and Hydrology Group examines drinking water, surface water, groundwater, and sediment on and near Laboratory property. In other monitoring efforts that take place both on the Laboratory site and on surrounding locations including several pueblos, the Ecology Group collects samples of foodstuffs—fruits, vegetables, honey, milk, herbs, eggs, fish, and deer and elk (muscle and bone).

■ The Laboratory annual report, *Environmental Surveillance at Los Alamos*, reports on the findings from all monitoring activities. The most recent edition is available at Laboratory Outreach Centers and on the World Wide Web (http://lib-www.lanl.gov/pubs/1a-1321.htm).

Annual Stack Releases of Tritium from Laboratory Operations 1985–1996



As the graph illustrates, measured levels of stack releases of tritium have shown a decrease over time. The decrease can be attributed in part to improved controls in the Laboratory's tritium facilities. (Note: A Curie is a unit of measure applied to radioactivity.)

Compliance with the Clean Air Act

In 1990, the Laboratory notified the Department of Energy that the Laboratory's stack monitoring program did not meet the new sampling requirements of the Clean Air Act as required by the Environmental Protection Agency.

In 1991 and 1992, the Environmental Protection Agency issued the Laboratory two Notices of Noncompliance with the Clean Air Act. The 1991 Notice was based on the way the Laboratory identified facilities with potential to release radioactivity, noncompliant stack monitoring equipment, incomplete quality assurance programs, and incomplete reporting. The 1992 Notice was issued because the Laboratory had used a shielding factor without Agency approval; when the shielding factor was not used, the Laboratory had exceeded the standard in 1990.

In 1994, Concerned Citizens for Nuclear Safety used the Clean Air Act to bring a lawsuit against the Department of Energy. The suit was resolved in early 1997 through a negotiated settlement. A few highlights of the settlement include an independent audit of the Laboratory's radiological air emissions compliance program, the addition of some environmental monitoring stations, and quarterly public meetings on the environment conducted by the Laboratory.

In the summer of 1991, the Agency and the Department of Energy began to work on a plan to address the noncompliances. This plan became a Federal Facilities Compliance Agreement and included the technical approach and schedules the Laboratory would follow to come into compliance.

In 1996, the Laboratory came into compliance with the Clean Air Act's Radionuclide National Emission Standards for Hazardous Air Pollutants regulations.

Involving the Community in Environmental Monitoring

Photographs, top and bottom: Jay Shelton, an instructor at Santa Fe Prep, teaches his students about radiation by having them look at potential environmental impacts from Laboratory operations. To date, they haven't found any.

The Laboratory works with people who live in our surrounding communities and who are interested in the potential environmental impact of our operations. Educators, tribal leaders, and members of the public can access printed information, technical personnel, and equipment to learn more about how the Laboratory interacts with the environment.

Jay Shelton, an instructor at Santa Fe Preparatory School, uses the Laboratory as a resource to help his students learn about radioactivity while they learn how to conduct scientific experiments. Shelton, who has a Ph.D. in physics, became interested in issues surrounding radioactivity after he moved to the Santa Fe area in 1988 and heard public concerns being expressed about the Laboratory's possible impact on the environment. After educating himself in the subject, Shelton now teaches his students by having them study this question. In one set of experiments, his students found that the instruments they were using detected airborne radioactive beryllium-7. But their research, he said, determined the source was natural rather than of Laboratory origin. "We've been looking for an environmental impact from Laboratory operations, but so far we haven't found any."

The Laboratory provides equipment loans and training that can help those outside our boundaries monitor our environmental impact. Currently, through the Neighborhood Environmental Watch Network (NEWNET) stations and the World Wide Web, the public has access to data from 17 New Mexico monitoring stations. The data collected include gamma radiation, temperature, precipitation, and wind speed and direction. Trained members of the public maintain the six NEWNET stations, which are located off Laboratory property. In October of 1996, a NEWNET station was moved from Santa Fe Prep to the Santa Fe Indian School so that another group of students would have an opportunity to study first hand how the station operates.

In addition to providing information to teachers like Shelton who want their students to learn more about radioactivity and its environmental impacts, the Laboratory makes technical expertise available to answer questions on a variety of environmental topics. During 1996, we received roughly 350 written requests for information—many of which related to environmental issues.

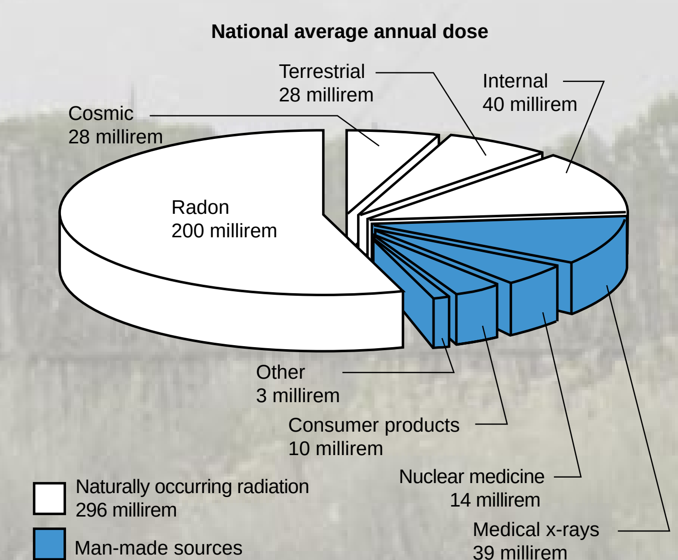
■ If you want to learn more about NEWNET, you can access information on the World Wide Web (http://newnet.jdola.lanl.gov/newnet.html).

If you are interested in the Laboratory's science education programs, you can access information on the World Wide Web(http://www.education.lanl.gov/SEP/Education.html).

Natural Radiation?

Since before the days of early man, radiation has been present on earth. Cosmic radiation from the sun and radon gas released from the earth are two examples of naturally occurring radiation. Background radiation includes these naturally occurring sources, radiation from some forms of elements (such as potassium-40) within our bodies, and a small amount of radiation from worldwide nuclear fallout. Today, for each individual, the national estimated average dose from background radiation is 300 millirem. In Los Alamos, the average dose is approximately 350 millirem. (A rem is a unit of measurement applied to human radiation exposure; a millirem is 1/1000th of a rem.)

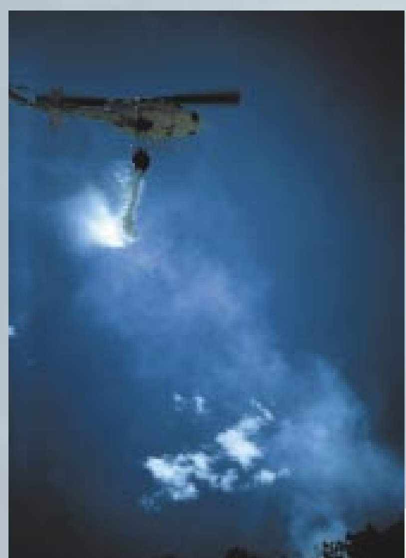
In addition to background radiation, people are exposed to an average of approximately 50 millirem of radiation a year in the form of x-rays and medical treatments. The Department of Energy's limit for additional maximum dose to the public is 100 millirems above background and sources such as medical, dental, and consumer products. In contrast, when on a routine flight of the space shuttle, each astronaut is exposed to 25,000 millirems of radiation.

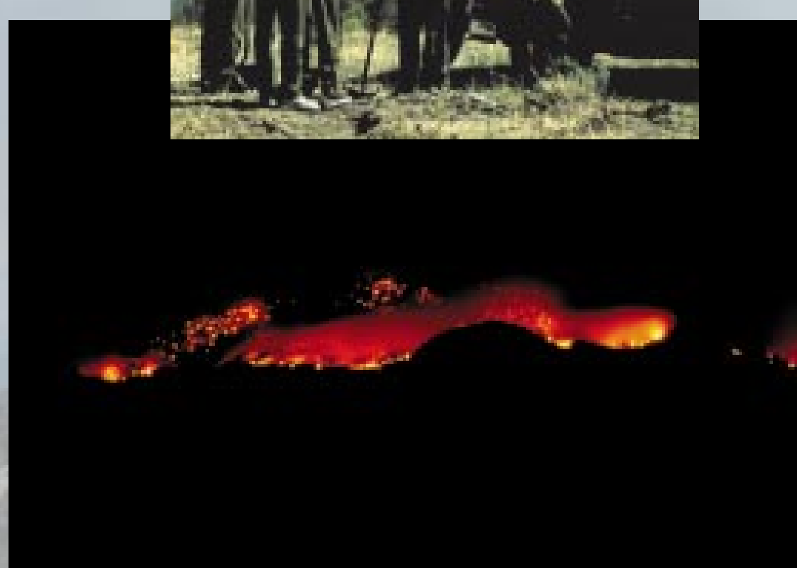


Photographs, top to bottom: A NEWNET station on site at Santa Fe Prep helped Jay Shelton and his students to learn about monitoring equipment; fifty of the 30-foot high NEWNET monitoring stations, like the one in this photo, are located primarily in New Mexico, Nevada, and Utah, where they detect gamma radiation and record meteorological data.

Dome Fire Teamwork

In April 1996, what began as a carelessly extinguished campfire suddenly became a four-acre wildfire that quickly accelerated into a thousand-acre firestorm. From its beginning, the Dome Fire in the Santa Fe National Forest and Bandelier National Monument held potential to be a major catastrophe. Natural and cultural resources were in danger along with, depending on the shifts of wind direction, Los Alamos National Laboratory facilities and any one of several communities in the vicinity.





In a spirit of cooperation, many citizens—each representing different agencies with vested interests and concerns—immediately banded together to avert this threat. The US Forest Service and Bandelier National Monument jointly activated teams of firefighters, which eventually numbered over 1,000 individuals. In addition to fighting the fire, this consortium, along with personnel from the Laboratory's Ecology Group, took measures to ensure that natural resources important to threatened and endangered species and valuable cultural sites were not unduly harmed during fire suppression activities.

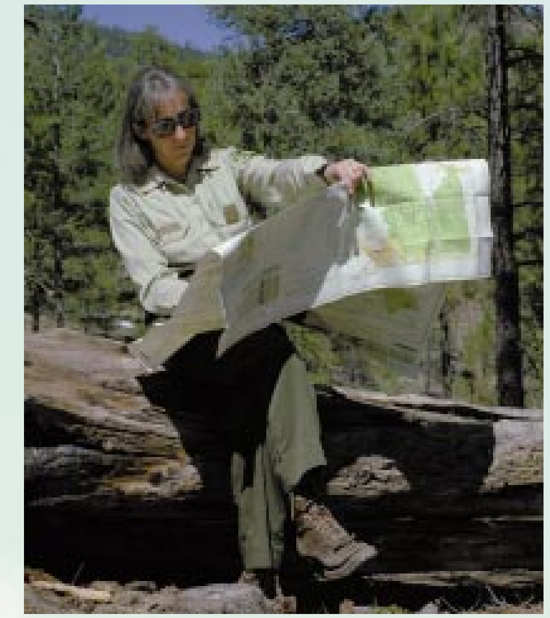
The Laboratory's first response to the fire threat was the same as it would be for any serious emergency—we set up an Emergency Operations Center. Led by Ed Nettles, the center assessed the possibility of the fire's reaching Laboratory property and developed measures to help protect this taxpayer investment and national resource. In coordination with the Los Alamos Fire Department and Johnson Controls World Services, Incorporated, the center initiated firefighting and fire preventive activities involving over 500 personnel and 40 Laboratory groups. Some of these activities included waiving the no-fly zone over Laboratory property and clearing a helicopter landing area large enough to accommodate four helicopters at one time, providing a transportable building to the US Forest Service for use at its base camp, constantly providing updated wind and weather information, and clearing firebreaks along the southern perimeter of the Laboratory.

Photographs, top to bottom: A helicopter dropping fire retardant on US Forest Service land; the demobilization of firefighters; a nighttime shot of the Dome Fire from across a canyon.

Background image: A view of the tremendous smoke cloud generated by the Dome Fire. The only difference between Dome Fire smoke and the more familiar smoke we see arising from US Forest Service controlled burns was the larger volume and greater density. This greater density probably created more problems for allergy sufferers and those with respiratory ailments.

To handle questions from the public, the Laboratory also formed a Joint Information Center, which was staffed around the clock by Laboratory, Los Alamos Fire Department, Department of Energy, and US Forest Service personnel. Claudia Standish from the US Forest Service and a member of the Joint Information Center recalls, "It was a tremendous cooperative effort. Everybody was so helpful. We were centrally located with many tools—fax machines, computers, phones—for keeping open vital lines of communication. We received many calls from concerned individuals and from local and international press."

When asked what she took away from the experience that she could use in other forest fire situations, Claudia replied, "The sooner we combine agencies into a partnership of mutual effort, the better prepared we will be."



Claudia Standish knows about wildfire. She began this education 16 years ago when she signed on with the US Forest Service Hot Shot and Engine Crews. Since then she has experienced all aspects of fire management. Today she is a wildfire management specialist with expertise in wildland urban interface fire planning and coordination.

"The sooner we combine agencies into a partnership of mutual effort, the better prepared we will be."

Interim Fire Management Team

After the Dome Fire, Los Alamos National Laboratory formed an Interim Fire Management Team cochaired by Ed Nettles, deputy group leader of the Emergency Management and Response Group, and Diana Webb, group leader of the Ecology Group. The team also brings together members from the Department of Energy, US Forest Service, Los Alamos Fire Department, New Mexico Environment Department, the pueblo of San Ildefonso, and Bandelier National Monument, along with Laboratory personnel involved with fire, environmental issues, storm water, archaeology, and site remediation.

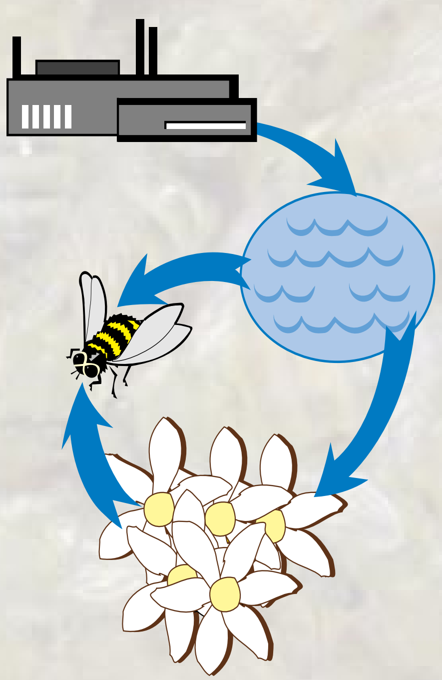
The team has developed a list of precautionary measures to make the Laboratory safer from wildfire. Some immediate measures include improving fire roads, widening firebreaks, clearing vegetation beneath power lines, and conducting prescribed burns. The team will develop long-term measures in cooperation with Laboratory facility managers, the US Forest Service, the Department of Energy, Bandelier National Monument, the Pueblo of San Ildefonso, and resource protection specialists.

Watch out for the Bee, Man!

Photographs top to bottom: Tim Haarmann using smoke to calm the bees; the queen bee on a brood comb.

Imagine opening a swarming beehive full of 30,000 honey bees when each has the potential to deliver a painful sting! Would you do it to collect 1000 honey bees for a sample? Ecologist Tim Haarmann does this as part of his day-to-day activities. He collects and studies honey bees as a way to check if Laboratory contaminants are being picked up by insects.

"Honey bees make ideal samplers because they forage in a large area—several square miles—for nectar, water, pollen, and plant resins, which they bring back to the hive. During these foraging flights, the bees can inadvertently contact and accumulate a wide array of contaminants, which are also brought back to the hive. These contaminants often become incorporated into the bee tissue, the wax, or the hive itself," explains Haarmann.



This illustration shows how contamination can move through part of an ecosystem. A contaminated lagoon provides water for flowers, which pick up some of the contaminants through their roots. Honey bees pick up contaminants both directly from water in the lagoon and indirectly from pollen and nectar from the flowers.

In the past, environmental monitoring has consisted primarily of taking measurements of abiotic systems such as air, water, and soil. However, understanding the interactions of contaminants when they move from abiotic sources to plants and animals is an important part of understanding the influences of the contaminants on nature. Because insects such as bees have simple anatomical systems and are an integral part of most food webs, they are a good place to begin.

Tim collects bee samples from hives placed near a radioactive cooling-water storage lagoon in a controlled experimental area within Laboratory property. He analyzes them for concentrations of contaminants, such as tritium, cobalt-60, manganese-54, and sodium-22, comparing these concentrations to those found in the lagoon and in the flowers growing in the area. From the data, he can tell that honey bees pick up contamination both directly from water in the lagoon and indirectly from pollen and nectar from the flowers. This information provides a model for understanding the movement of contaminants into other living systems.

Honey bees play another role—hives have been placed around the perimeter of the Laboratory, and honey samples are collected and analyzed annually. The testing of these hives validates that honey collected by local beekeepers does not contain unsafe levels of contaminants for human consumption.

As a member of the biology team in the Laboratory's Ecology Group, Tim does more than collect bees. His team also collects data on and near Laboratory property about plants and animals, including threatened and endangered species. Team members use this information to review planned and ongoing Laboratory activities for possible impacts on plants and animals. The biology team is responsible for seeing that the Laboratory complies with the Endangered Species Act, the Migratory Bird Treaty Act, the Bald Eagle Protection Act, and the Wetlands Preservation Act and protects species listed under the New Mexico Conservation Act and Endangered Species Act.

What's around the Corner?

In 1996, the Ecology Group began working on a Threatened and Endangered Species Habitat Management Plan. The plan will be used to help make land use decisions and to evaluate the Laboratory's impact on animals like the Mexican spotted owl, which is considered threatened under the Endangered Species Act.

Building upon the Threatened and Endangered Species Habitat Management Plan, the biology team hopes to develop a Natural Resource Management Plan that incorporates what is known about all animals and factors in forest management, fire management, ecological risk assessments, and wetland issues.

"We know that contaminants are available for plants and animals to absorb. I am investigating what happens to those contaminants as they move through an ecosystem."

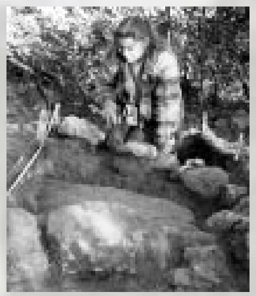
Tim Haarmann never met a bee he didn't like. Tim first started studying bees during his undergraduate days at Brigham Young University. Subsequently, he served as a Peace Corps volunteer in Paraguay, where he and his wife taught farmers about keeping Africanized honey bees (a.k.a. "killer bees") and increasing their income by selling honey.

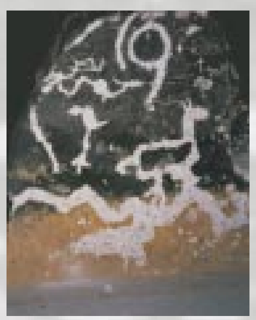
Tim grew up and graduated from high school in Los Alamos. Currently, he's a Ph.D. candidate, majoring in biology at the University of New Mexico, where he specializes in ecosystems ecology. In 1995, Tim became a staff member at the Laboratory. The study of bees as "little samplers" is only one of his contributions to the work of the Ecology Group.

Archaeology in Real Time

The time is early 14th century. On the Pajarito Plateau, the early-summer morning breaks fresh and cool as the sun clears the mountains across the valley to the east, illuminating the cliff face where a cliff-talus pueblo is situated amidst the piñons and junipers. The hunters have already left, following the game trails west into the mountains. The rest of the inhabitants begin to stir. Some tend the cook fires. Others work the small fields where maize, beans, or squash are growing. Still others go to the work areas to tan hides or fashion spear points from obsidian. Children play at the stream.

This scene is based on information obtained by the cultural resources team of the Ecology Group at Los Alamos National Laboratory. The archaeologists, modern-day hunter-gatherers, are charged with locating these sites, called cultural sites because they pertain to the progression of human culture through time. They gather information available from studying evidence that remains.





Photographs, top to bottom: Kari Manz, member of the cultural resources team, works to excavate an horno; petroglyphs from a cave in Mortandad Canyon; a cliff of the type that may contain ancient ruins or petroglyphs, such as the one in the center photo.

Cultural sites are located all over the Pajarito Plateau—almost 1,400 known prehistoric sites exist on Laboratory property alone. A few date back as far as 6000 BC. Most, however, date to the 13th and 14th centuries, with some considered sacred to today's local Native American population. Still other sites relate to the Homestead Era of the late 1800s and early 1900s.

Each site has a story, a description of a way of life that no longer exists—that can only be surmised by what is left behind for the archaeologists to find. Even though these sites represent the past, they can determine the progress of activities proposed at the Laboratory today.

Federal regulations dictate that the cultural resources team review planned activities at the Laboratory for possible impacts to cultural resources. The team reports to the New Mexico State Historic Preservation Officer. If the site in question relates to Native American past, the team also consults with the governors of four Pueblos—San Ildefonso, Santa Clara, Jemez, and Cochiti—and the Mescalero Apache and Zuni tribes. In many cases, plans are modified to avoid a site. In other cases, when impacts cannot be avoided, the archaeologists will excavate the site and record all pertinent information.

Such is the case with the Romero homestead, a 15-acre ranchito settled in 1913 by Victor and Refugia Romero and their six children. The Romero family occupied the place until 1942, when the federal government acquired the property and compensated the owners. Left behind were a cabin, a smaller log structure, a chicken coop, a privy, and several large trash areas.

In the mid-1980s, a proposed expansion of Technical Area 55, including a rerouting of Pajarito Road, was slated to overrun the area that contained the Romero homestead. Before the proposed expansion could take place, our Laboratory undertook a project to relocate and restore the cabin and to recover and catalog all of the artifacts that could be found on the property. Today an extensive written record of all the artifacts remains while the Romero cabin itself once again stands, but on a site close to the Los Alamos Historical Museum where it can be seen by visitors.

■ For further information concerning future plans for the Romero cabin display or other historical interests, call the Los Alamos Historical Society and Museum at (505) 662-6272 or go to the World Wide Web site (http://www.losalamos.com/lahistory).

The Romero cabin, which was donated by our Laboratory to the County of Los Alamos for public viewing—in its original condition, during relocation, and as it looks today.

Federal Regulations for the Protection of Historical and Cultural Sites on Laboratory Property

National Historic Preservation Act (NHPA), Public Law 89-665 USCA 470aa-11

- Protection of Historic and Cultural Properties, 36CFR800
- National Register of Historic Places, 36CFR60
- Determinations for Eligibility for Inclusion in the National Register, 36CFR63
- National Historic Landmarks Program, 36CFR65
- Secretary of the Interior's Standards for the Treatment of Historic Properties, 36CFR68
- Curation of Federally Owned and Administered Archaeological Collections, 36CFR79

Archaeological Resources Protection Act (ARPA), Public Law 96-95, USC 470

- Protection of Archaeological Resources, 43CFR78

Native American Graves Protection and Repatriation Act (NAGPRA), Public Law 101-601

American Indian Religious Freedom Act (AIRFA), Public Law 95-341

Protection and Enhancement of the Cultural Environment, Executive Order 11593

Sacred Sites: Executive Order 13007

Waste Reduction Rewards

Winners from our Laboratory's fourth annual Waste Minimization Awards Program. Photographs from top to bottom: Joseph Gonzales from the Chemical Science and Technology Division; the Lead Recycling Team from the Engineering Sciences and Applications Division; and the Printed Circuit Shop Waste Reduction Team from the Dynamic Experimentation Division.

Data for the Laboratory's Site-Wide Environmental Impact Statement support estimates that the Laboratory will produce 100,000 cubic meters of radioactive and hazardous waste in the next ten years. This amount would fill a football field to the fifteenth row in the bleachers. If we added a projected 100,000 cubic meters of sanitary waste—mainly from administrative, custodial, and canteen operations—the level of the waste pile would rise to above the thirtieth row.

However, Tom Baca, Program Director of the Laboratory's Environmental Programs, believes that "with better practices, better technology, and more efficient operation, much of our next ten years' waste can be avoided." Better practices could mean greater recycling efforts. Better technology and more efficient operation could mean devising a new process.

To encourage waste avoidance, our Laboratory sponsors an annual Waste Minimization Awards Program that recognizes individuals who create ways to reduce or eliminate waste generated from Laboratory operations. In 1996, cash awards were given to seven teams comprising 67 Laboratory employees who wholeheartedly embraced the waste avoidance concept within their workplace.

Here are three examples that illustrate how waste avoidance works. Joseph Gonzales, who works in Chemistry and Metallurgy Research, reduced the amount of waste sent to the Radioactive Solid Waste Disposal Facility. He separated the upgrade waste—waste that can be made into other products—and recycled it. In another effort, a team of six individuals from the Engineering and Science Applications Division refined an operations process enough to reduce the amount of needed lead by 50,000 pounds. Yet another team of 11 from the Dynamic Experimentation Division eliminated a projected 300,000 gallons of waste water by redesigning a water circulation system.

These three efforts alone saved more than $2 million in disposal costs for 1996. Efforts throughout the Laboratory to avoid waste reduced the waste generated in 1996 by 15,700 cubic meters—and saved almost $40 million. Over the next ten years, this rate of waste avoidance would keep the Laboratory's waste pile down to only eight rows of bleachers.

Reflecting on the awards from waste reduction, Tom Baca notes, "We must become stewards of our environment, both locally and globally through the products we buy, the technologies we develop, and the example we set."

Site Remediation—Progress in 1996

From 1948 to 1965, Material Disposal Area M received many types of waste. Until the mid-1960s this site had received debris such as scrap building material, concrete, depleted uranium, explosives, lead, asbestos, car parts, and old tree stumps. Remediation took place in 1996 and included the following waste minimization practices:

- Debris was separated to avoid generating mixed waste (radioactive material mixed with hazardous waste) and to identify commercial waste. Separation reduced the volume of contaminated waste, which requires special handling and costs more for disposal. This step alone saved more than $5 million in disposal costs.
- Metal and concrete were recycled, reducing the amount of commercial waste by 80,000 pounds.
- Waste destined for disposal was compacted and packaged in bulk.
- Contaminated soil was loaded directly onto trucks rather than into disposable containers and transported to disposal sites. (The trucks were then decontaminated.)

Before: This photograph is a closeup of the debris that had been dumped in Material Disposal Area M, despoiling much of this woodland area.

After: In 1996, removal of debris resulted in a restored Area M. Taken from a wider angle, this scenic shows the same area as it appears today.

"We must become stewards of our environment, both locally and globally through the products we buy, the technologies we develop, and the example we set."

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Other photographs courtesy of Bandelier National Monument; Protection Technologies Los Alamos; Ecology Group, Environment, Health, and Safety Division.

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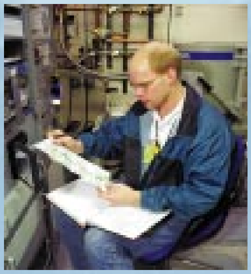
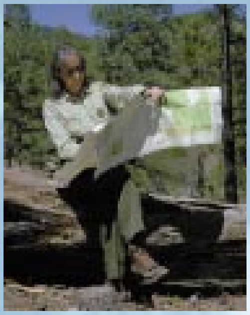
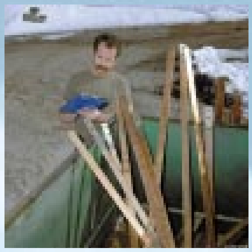

Los Alamos
NATIONAL LABORATORY

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